**Product Performance Data Evaluation Review**

by
Kevin J. Sweeney, Entomologist
Insecticides Branch

Kevin J. Sweeney 12/11/02

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Product: Multicide Fogging Concentrate 2798

EPA File Symbol: 1021-RTOL

Reviewer: Linda DeLuise

PM: George LaRocca, PM 13

DP: D286063

Submission: S622971

OPPTS Guideline: 810.3400

Active ingredients: prallethrin 1.00%; d-phenothrin 5.0%; piperonyl butoxide 5.00%

Site: Outdoor residential and recreational areas for adult mosquito control. Aerial and ground ULV applications are proposed on the pending label.

Pest: all mosquitoes, gnats, biting and non-biting midges, black flies and other biting flies

This is a new use pattern (a mosquito adulticide use) for the synthetic pyrethroid prallethrin. Generally, the EPA evaluates active ingredient specific data for the efficacy of a new use pattern followed by the review of product specific efficacy data. However, the submitted product performance data are not prallethrin specific. Instead, the subject product is a mixture of prallethrin, d-phenothrin, and PBO. MGK has requested a section 3 registration for this product only as a mosquito adulticide.

The submitted study discussed in this review does not demonstrate or allow us to assess the efficacy of synergized prallethrin or prallethrin sprayed alone as a mosquito adulticide. The EPA database on d-phenothrin efficacy is also limited. I requested copies of all previously submitted prallethrin as well as d-phenothrin specific mosquito adulticide efficacy studies. They will be reviewed in a separate document.

Submitted Studies/Data:

**MRID 45762907 Mosquito Adulticide Efficacy Testing, Multicide Fogging Concentrate 2800 and 2798. Formulations containing d-phenothrin, prallethrin, and piperonyl butoxide as Active Ingredients by William Jany and Frances Krenick, Clarke Mosquito Control.**

**This study tested the lowest per acre application rate of undiluted product against mosquitoes from multiple genera in two different geographic locations.** Only truck mounted ground ULV applications were tested. Each field plot treatment consisted of three to four replicates each, 25 feet apart, at 150 feet from the path of the sprayer. Four treatments were made at each site.

At a swath of 150 feet, the product appears to be efficacious at the lowest label rate when applied undiluted. Twenty-four hour mortality averaged about 95% (which is the EPA performance standard but only at two instead of five geographic locations). Sprayer droplet size was measured in terms of Mass Median Diameter. Volume Median Diameter values were not reported.

**Application Type:** Ground ULV with a truck mounted forced air or electric power sprayer. Data were submitted for forced air sprayers only. Electric ground ULV data is also required. Data must be submitted for aerial application with fixed wing aircraft. See discussion below on aerial application.

**Test compound:** Multicide Fogging Concentrate 2798 and 2800. The 2798 formulation is the pending subject product. The 2800 formulation is a RTU 0.02% prallethrin. 1.0% d-phenothrin, 1.0% PBO product.
For both products:
Prallethrin/PBO ratio equals 1:5 parts.
d-phenothrin/PBO ratio equals 1:1 parts

EPA registered Biomist 1.5% permethrin + 7.5% PBO (1:5 ratio) was used as a positive control insecticide product.

**Application rate**: These rates apply to ground ULV and aerial application. Apply 0.00027 lbs. prallethrin/acre and 0.0012 lbs. d-phenothrin/acre and 0.0012 lbs. piperonyl butoxide/acre. This is equivalent to only 0.41 oz. product/acre, an extremely low application rate. The label recommends 0.0005 lbs. prallethrin/acre, equivalent to 0.75 oz./acre.

The application rate of permethrin in Biomist 1.5 + 7.5 was 0.0012 lbs. permethrin/acre.

**Flow rate when applied undiluted**: The flow rates are as follows: 5 m.p.h. delivers 1.2 oz./min; 10 m.p.h. delivers 2.5 oz./min; 15 m.p.h. delivers 3.7 oz./min; and 20 m.p.h. delivers 5.0 oz./min. Flow varies with speed of the truck. A FMI piston pump was used with both sprayers. In this study, the flow rate was 71ml and 35.5ml, equivalent to 2.4oz. at 10 m.p.h and 1.2oz. at 5 m.p.h, in order to provide a spray volume of 12.9ml (0.44 oz.) per acre. According to the label, at the application rate of 0.00027 lbs. prallethrin/acre, 0.41 oz. of undiluted product are sprayed per acre.

**Flow rate when applied diluted**: The dilution directions and flow rates should be calculated on the basis of "dilution by parts" instead of stating the concentration of product in terms of a percent value. The former method is easier for applicators to use. If desired, the % concentration can remain. The dilution charts as currently written appear to provide dilution by parts of up to 1 part product : 5 parts diluent, expressed as d-phenothrin concentration. As indicated in the dilution table, the pump will have to deliver more end-use dilution per minute when compared to the application of undiluted product. The flow rates of solution per minute are acceptable but what data support the per minute flow rates over 25 oz./min? The amount of end-use dilution applied per minute will be limited by the capacity of the pumping system and the sprayer equipment to achieve the proper flow and spray droplet calibration. Most sprayer equipment being sold cannot achieve acceptable calibration at very high flow rates.

Product dilutions were not tested in this study. These dilutions need to be tested to measure droplet size variation and product performance.

Add directions that tell the applicator how to prepare the end-use dilutions.

What diluent oil viscosity range is considered as a "suitable solvent"?

**Droplet size diameter, droplet size distribution, and swath width of fog.**

**Ground ULV**:
Mass Median Diameter = 5 to 25 microns according to the label. The study stated that a Grizzly sprayer (16 hp B & G engine, ROOTS 350 CFM blower, and IHPLAT nozzle with a 90 degree orientation) operating at 3.0psi, while delivering product to the nozzle at the flow rate of 71.0 ml/min that resulted in a fog with a droplet MMD equal 25.0 microns. The Cougar sprayer (8 hp B & G engine, ROOTS 100 CFM blower, and IHPLAT nozzle with a 90 degree orientation) operating at 3.0 psi, with a flow rate of 35.5ml, sprayed a fog with a droplet MMD equal to 28.5 microns.

In the field plots, the rotating slides collected (an unknown number) droplets with MMD values ranging from 11.5 microns to 43.2 microns at 150 feet from the sprayer path. The mean MMD was 20.15 microns with the Cougar sprayer application in Illinois. In the Florida field trials, the mean MMD was 14.41 microns with the Grizzly sprayer.

An AIMS device was used to measure the MMD at each site as well. The MMD was 14 microns (7.5 feet from the nozzle) with the Grizzley sprayer and 13.5microns (four feet from the nozzle) with the Cougar sprayer. Droplet size distribution is not stated on the label or in the submitted study. It is interesting to note that the MMD was larger at 150 feet from the sprayer for the Cougar sprayer applications but about the same at 150 feet with the Grizzly. This probably indicates that the droplet distribution is different with sprayers or it could indicate higher wind speed at one site when compared to another. Volume Median Diameter was not mentioned on the label or reported in the study.

**Swath width**: a standard swath width of 300 feet is stated on the label but the field plots in the study only tested replicates with a 150 foot swath width. Spray droplets or efficacy were not measured at distances up to 300 feet.

**Calibration**: method not explained completely except for AIMS device.

**Aerial Applications (label does not state if this applies to fixed wing aircraft or rotary aircraft or both).**

Aerial application data must be submitted.

The Mass Median Diameter is larger than stated above for Ground ULV and equals 30 microns or less. These are small droplets for aerial application.

Is there a minimum or maximum number of nozzles recommended on a fixed wing aircraft?

**Flat Fan Nozzles**: as the label states, a 30 micron MMD may be difficult to achieve in a low pressure spray system with flat fan nozzles. Much higher pressure at the nozzle tip may be required. How will a higher MMD impact the efficacy of the application, especially when applying at such low volumes? Can air speed compensate for low pressure delivery?

**Rotary Atomizers**: label states that they be set at maximum RPM, but no data are provided to show how many RPM are required to achieve efficacy or the desired MMD and droplet distribution. The minimum RPM needs to be stated. Is the labeling inferring that the minimum RPM value be 10,000 RPM.

Flight height: a range is not reported but needs to be stated on the label.
Swath width: not mentioned. Add to the label.
Calibration: not mentioned. What is the minimum number of droplets to be measured to calculate a reliable value for the MMD and to determine "2.5% of the droplets should not exceed 100 microns".

**Study Design and Results**:

**Design:** Field studies were conducted on Florida and Illinois in July, 2002. Field collected adult female mosquitoes (age unknown) were tested. Mosquito species tested at the Florida site consisted of only one species, *Ochlerotatus taeniorhynchus,* the black saltmarsh mosquito. The Illinois site was a mixed species population consisting of *Coquillettidia perturbans*, *Ochlerotatus trivitatus* and *Culex restuans*. The West Nile/SLE vectors *Cx. pipiens* and/or *Cx. quinquefasciatus* were not tested.

Circular cardboard mosquito cages with mesh surfaces were suspended from wooden stakes five feet above the ground. Treatment replicates were located downwind from the sprayer's path while control cages were located at an upwind location. Twenty adult female mosquitoes were aspirated into each test cage. The total sample size was 700 female mosquitoes. Exposure time was 10 minutes. Knockdown determinations were made at one-hour while mortality was assessed at 24 hours post treatment.

Results:

The 2800 formulation was not efficacious because the percent control was below the performance standard of 95%.
On average, the subject 2798 formulation provided 95% or better control, with 94.25% control of saltmarsh mosquitoes and 96% control of woodland and domestic mosquito species. These data apply to a swath width of 150 feet.

Both the 2800 and 2798 formulations outperformed the registered Biomist 1.5 + 7.5 formulation.

**Entomologist's Recommendations:**

1. Field test the undiluted and 1:5 dilution for ground and aerial applications. State the diluent used. State the calibration results and report the MMD/VMD values from the rotary slide devices. Include an explanation of how the calibrations were performed.

2. Submit aerial application product performance data with the subject product. Amend the aerial application directions and address the questions presented in the review above. Perform tests with flat fan nozzles and rotary atomizers. Data shouldbe submitted from a minimum of three geographic locations.

3. Submit ground ULV data using a standardized field evaluation design. Cage placement shall be in three rows with a minimum of three cages per row set 50-100 feet apart. Rows shall be 100, 200 and 300 feet downwind from the spray path. More than three rows may be used. Rotary slide droplet collection devices should be mounted alongside the cages to collect droplets at 100, 200, and 300 feet from the sprayer path. The MMD and VMD values should be calculated and the number of droplets used to make this determination reported. Report the range and distribution

of droplet size.

Only female mosquitoes shall be tested. A minimum of 20 individuals should be placed in each cage. Three or more control replicates shall be located upwind of the fog.

Knockdown should be assessed at one hour after spraying. Twenty four hour mortality shall be reported.

4. Submit the sprayer calibration results and the AIMS test results. State the method used to calculate the MMD and VMD and refer to it on the label.

5. Append the raw data sheets to the study submission.

6. Test electric ULV sprayers. I also suggest that you also perform testing a LECO HD with variable flow control system because this is still the most common ground sprayer used.

7. I will review the other prallethrin and d-phenothrin product performance data and submit the review to MGK.

8. Submit product performance data on biting flies including black flies, stable flies, tabanid flies, and ceratopogonid biting midges (no-see-ums) for ground ULV spraying. Aerial spray data may be appropriate for controlling stable flies in Florida. These data may be a condition of registration provided they are submitted within 12 months after the Section 3 is issued.

9. Testing should be done when a more pronounced temperature inversion exists.

10. At a minimum, test *Culex quinquefasciatus*, a species from the genus *Anopheles*, and a saltmarsh mosquito species from the genus *Ochlerotatus*. Collect data from five geographic areas as directed by the EPA guideline.

11. Swath width should be determined based on the distance where 90% or greater mortality exists. However, the mean mortality for all test results should be 95% or greater as directed by the EPA guideline.

12. Currently, field testing is limited to 10 acres or less unless an Experimental Use Permit (EUP) is issued. Therefore, I suggest that an EUP be considered in order to collect the needed efficacy data for product registration.

13. If MGK wishes to register a prallethrin only product such as RESPONDE, prallethrin only efficacy data must be submitted. The data on file at EPA are not sufficient to satisfy the product performance requirements.